Grid 5.0

Problem Statement

With e-commerce companies using complex automation systems to scale for customer demand, there are still multiple areas that require human intervention. Sortation is a huge problem statement for all e-commerce companies. To ensure packages reach over 19,000 pincodes in India, massive automation systems are employed by all companies. However one area that still faces challenges is essentially the act of “Automated Singulation”. Picking up a parcel from a bulk of shipments and putting it on the conveyor belt. Please see Sample Video for more context.

This year’s problem statement is targeted at solving this real-world use-case.

Objective

This competition aims to test the following capabilities of contestants

1. Ability to detect individual packages from a group of packages
2. Pick a package from that group and drop it in the Drop-Zone
3. Shipment barcode should be present on top when dropped in the Drop-Zone

Team Criteria

1. All team members can be from cross - college
2. Team size must be limited to a maximum of 6 members
3. Changes to the team will be allowed till the close of Elimination Round 1 submission
4. All teams must build a system and demonstrate it’s working
5. Participation certificates for all team members who demonstrate working prototype

System Specifications

- A picking arm
- A picking methodology for end effector such as Claw/clamp/Gripper/Suction grasp (Advance gripping method like force feedback grasp/haptic feedback grasp can also be used)
- You may use one or multiple vision systems (or) a combination of vision and sensor based systems
- Your system can be connected to a live PC for processing inputs

Round II

There will be 3 types of packages - 30 packages with a Max Package weight < 500 gms

1. 10 small box type packages - approx dimensions 2.5x4x8 inches - **Example**
2. 10 medium box type packages - approx dimensions 12x8x6.5 inches - **Example**
3. 10 flyer type packages - approx dimensions 13x10x2 inches - **Example**

All packages will have a shipment label on one side.

Expected Process

1. All packages must be kept in a jumbled manner in a trolley. Shipping labels should be facing on top, down, sideways, etc. - in all directions. Reference Image
    a. This activity of jumbling the packages before starting should be done on camera before starting the picking process
2. A 2 x 2 feet area needs to marked out on the floor or elevated surface next to the trolley
3. The system is expected to pick up items from the trolley one at a time and keep them within the marked area
    a. A package can be removed from the marked area manually once the parcel has been dropped there
4. It is expected that the packages will have the shipment label facing on top
    a. Packages with shipment label not facing the top will not be counted
5. Time is up when all the parcels are moved to the area

No Manual intervention is allowed with the program once the competition starts.

Judging Criteria for Round II

Teams that successfully demonstrate at least movement of packages to Drop-zone will move to round 2. Conditions of label being on top will be relaxed for round 1. Incase there are more than 50 teams that demonstrate movement of all 30 packages to Drop-zone then we will make the label facing on top and time taken to complete the activity as further filtration criteria.

Teams that do not demonstrate the ability to pick at least 1 package, lift it up, and drop it in the dropzone will not make it to the next round.

Deliverables for Round II

1. Pictures of your setup
2. BOM of equipment used along with sourcing
3. Short explanation of how you built the hardware and software - Less than 1 min

4. **Uninterrupted and unedited** Video of the system performing the task - with a timestamp to indicate start and end - This can be shot with a handheld or phone camera
5. **Uninterrupted and unedited** Video of Live Image Processing from the cameras - with a timestamp to show how Arena is being analyzed in real-time

Round III

This will be held in person in conjunction with some University. The problem statement for this will be released with the Round 2 results. It will build upon the complexity of the Round II problem statement.

Appendix

Example-1: Small Box

Example-2: Medium Box

Example-3: Paper Pouch

Example-4: Filled Trolley